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ABSTRACT

This report presents the results of a survey conducted by the National Science Foundation (NSF) in late 1986 of more than 14,000 applicants whose proposals for research support had been awarded or declined during fiscal year 1985. The principal purpose was to seek the views of individual investigators at academic institutions about NSF's competitive proposal review and decision making process. Two-thirds (more than 9,500) responded. The reasons most often volunteered by dissatisified applicants about the review process were that the reviewers selected by NSF were not sufficiently expert in the subject matter of the proposal, or that the reviews were cursory, conflicting, or did not seem to support NSF's decision. Applicants' views varied according to their experience, i.e., depending roughly on the proportion of awards they received to proposals submitted. Applicants' experiences, actions and views also differed according to which NSF research support division handled their proposal(s). The report also contains the first cross-tabulation of applicants' fields of research to the NSF research support divisions, and the initial chart of award rates by division for first proposals and resubmittals. (The survey form is included.) (ML)

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National Science Foundation
Report 88-4

February 1988

# PROPOSAL REVIEW AT NSF:
## Perceptions of Principal Investigators

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**Report of a Survey by**
**NSF's Program Evaluation Staff**

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Report 88-4

February 1988

# PROPOSAL REVIEW AT NSF:
## Perceptions of Principal Investigators

Report of a Survey by
NSF's Program Evaluation Staff

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NSF 88-4
February 1988

# PROPOSAL REVIEW AT NSF: PERCEPTIONS OF PRINCIPAL INVESTIGATORS

## I. Summary and Highlights

This report presents the results of a survey conducted by NSF in late 1986 of more than 14,000 applicants whose proposals for research support had been awarded or declined during fiscal year 1985. The principal purpose was to seek the views of individual investigators at academic institutions about NSF's competitive proposal review and decisionmaking process. Two-thirds (more than 9,500) responded.

Nearly half the applicants were satisfied with the review process, but a substantial proportion (38%) were dissatisfied. Declinees (two-thirds of the applicants) were much more likely to be dissatisfied. This was particularly true of the 27% of repeat applicants whose proposals were consistently declined.

The reasons most often volunteered by dissatisfied applicants were that the reviewers selected by NSF were not sufficiently expert in the subject matter of the proposal, or that the reviews were cursory, conflicting, or did not seem to support the Foundation's decision. Reasons such as cronyism, politics or biases of various types were cited less frequently.

Whether awarded or declined, one-third of respondents felt that the reviewers' comments helped them to understand the Foundation's decision a great deal. Two-fifths of those who received awards said that the reviewers' comments influenced the course of their subsequent research.

Applicants' views varied according to their experience, i.e., depending roughly on the proportion of awards they received to proposals submitted. Campus-based individual applicants fell into six "experience classes," ranging from those who submitted one proposal in five years and were declined, to those who applied many times and received awards every time. More than a quarter submitted proposals repeatedly but without success; they were the persons most likely to be dissatisfied and to believe that decisions to decline their proposals were made unfairly. The smaller group (13%) who consistently received funding for their proposals were much more satisfied with the review system.

Applicants' experiences, actions and views also differed according to which NSF research support division handled their proposal(s); in addition to considerable variation in award rates, the nature and frequency of pre- and post-review contacts differed in important respects by division.

Investigators who wrote, telephoned or visited a program officer before submitting a proposal were somewhat more likely to receive an award. (The survey did not address the reasons, but experience shows that in some cases investigators decide on the basis of such contact not to submit a proposal, and in other cases are able to sharpen a proposal before submitting it.)

Over a quarter of those whose proposals were declined subsequently resubmitted them to NSF, in most cases with substantial revisions; a fifth submitted them to another funding source; and nearly half indicated that they had taken no further action by the time of the survey.

Persons declined on their first proposal were less likely to contact a program officer for an explanation of the decision, less likely to resubmit revised proposals, and more likely to take no further action, than other types of applicants. Those who had previously received several awards were much more likely to make follow-up contact and to resubmit their proposals.

Other results of the survey include:

-- 17% or more of the applicants to engineering and computer research programs, and 9% of all applicants, were of Asian background; 2% were members of other minority groups;

-- for 29% of applicants (51% of women), the proposal that was the object of the survey was the first they had submitted to NSF as an independent principal investigator;

-- 20% were competing for further funding of current NSF-supported work, while 80%, some of whom had current NSF funding, said their proposal was for new work;

-- 29% indicated that their proposal was for multidisciplinary research;

-- 75% of all applicants, and 97% of consistently successful ones, had served as a reviewer or panelist for NSF at least once in the five years before the survey;

-- the proportion of proposals being resubmitted following an earlier declination was 29%;

-- for many divisions, and for the Foundation as a whole, the award rate for resubmittals (27%) was less than that for first submittals (36%).

The report also contains the first cross-tabulation of applicants' fields of research to the Foundation's research support divisions, and the initial chart of award rates by division for first proposals and resubmittals.

# PROPOSAL REVIEW AT NSF:
# PERCEPTIONS OF PRINCIPAL INVESTIGATORS

## II. Introduction

In November 1986, the National Science Foundation mailed a 16-page, 43-question survey to 14,282 scientists and engineers whose competitively-reviewed proposals for research grants had been awarded or declined by the Foundation during fiscal year 1985 (October 1, 1984 - September 30, 1985). The purposes were to characterize the "traditional" applicant population, to explore their attitudes about the Foundation's proposal review system, and to seek their views about several matters relating to program operations.

This report describes the applicant population in general terms and by six categories of proposal/award experience, characterizes their proposals and awards, and summarizes their views of the Foundation's proposal review system.

The survey was targeted toward individual investigators at academic institutions. Several types of proposers were not surveyed: those who withdrew their proposals before a decision was made; those who applied through the small business program; those requesting support for centers, facilities and similar organizations; and applicants to programs that employ non-standard review processes (e.g., the Presidential Young Investigators program). Investigators who received decisions on more than one proposal during FY 1985, about one-seventh of the targeted group, were asked to report on the proposal that was the subject of the latest decision.

Two-thirds, or more than 9,500, survey recipients replied by January 9, 1987, when coding of responses was ended. About 88% of survey recipients who received grants in FY 1985 responded, and 52% of those whose proposals had been declined. All of the data on which this report is based has been adjusted to account for the disproportionate response rates by decision and NSF division so as to reflect the entire target population.

The process for handling survey responses was designed to protect the anonymity of individual replies. Questionnaires were mailed by a survey research firm which also collected the responses, coded unstructured narrative comments, and created the data base. The resulting data was supplied to NSF's Program Evaluation Staff for analysis and reporting purposes. No attempt was made to link responses to particular persons or proposals.

The survey form is reproduced in Appendix G, with percentages of answers marked beside each question. Much of the analysis in this report was derived by combining various responses. More detailed information is available upon request (Note 1).

A full understanding of the results of the survey requires a substantial degree of familiarity with the proposal review and decisionmaking systems employed by the various research divisions. Readers who are not entirely familiar with the review processes are referred to the description in Appendix A. The organizational structure of the Foundation's research support divisions included in this study are shown in Appendix B.

## III. The Applicant Population in General Terms

At various points in the questionnaire, applicants were asked to check categories indicating their sex, race, and type of academic institution, and to state their field of science or engineering and year of highest degree. On the basis of self-reported data, the population of individual investigators whose proposals were awarded or declined during FY 1985 (Note 2) was as follows:

(1) Sex: 87% were men, 13% women.

> Women were more numerous (14% or greater) among applicants to eight divisions, including all five divisions of the Biological, Behavioral and Social Sciences Directorate as well as the Information Science and Technology, Ocean Sciences and Research Initiation and Improvement divisions. They were least numerous (8% or fewer) in four of the five Engineering divisions, three of the four Geosciences divisions, and four of the five divisions of the Mathematical and Physical Sciences Directorate.

(2) Race: 89% were white, 9% Asian, and 2% members of other racial/ethnic groups.

> Asian applicants were most numerous (17% or greater) in the five Engineering divisions and the Division of Computer Research. They were least numerous (6% or less) among three of the four Geosciences divisions and the Astronomical Sciences, Chemistry, Behavioral and Neural Sciences, Biotic Systems and Resources and Social and Economic Sciences divisions.
>
> Proposal submission by non-Asian minorities was small (less than 2%) across the Foundation, but relatively higher (3% or more) in three Engineering divisions, the Information Science and Technology Division and the Research Initiation and Improvement Division.

(3) "Professional age": 21% of applicants had received their highest degree since 1980, 41% received it between 1970 and 1979, 26% between 1960 and 1969, and 11% before 1960.

(4) Institution: 23% had submitted their proposal(s) through one of 21 academic institutions listed on the survey form that received 60 or more competitively reviewed individual-investigator research grants from NSF in FY 1985 (Note 3); 62% had submitted through another Ph.D.-granting institution; and 11% through a primarily undergraduate institution. The remaining 4% indicated "other" (note 4).

(5) Education: 45% received their highest degree from one of the 21 named institutions, 54% from another Ph.D.-granting institution, and 1% from a primarily undergraduate institution. 22% had received their B.S. or B.A. degree from one of the 21 institutions, 49% from another Ph.D.-granting institution, and 29% from a primarily undergraduate college or university.

(6) Reviewer/Panelist: 75% of the surveyed group had served as a mail reviewer or panelist for NSF at least once in the five years before the survey. The lowest percentages (<66%) were in four divisions of the Engineering Directorate, and the highest (>90%) in three divisions of the Geosciences Directorate. 90% of awardees, and 67% of declinees, had some experience as a reviewer or panelist. Younger investigators, and those from primarily undergraduate institutions, were much less likely to have had such experience.

(Note: Although comparable data from previous years is not available, the FY 1985 applicant population undoubtedly included more first-time women applicants; the Research Opportunities for Women program, initiated in FY 1985, received 404 proposals. Moreover, special efforts to attract applicants from primarily undergraduate institutions began the previous year and were expanded in FY 1985.)

## IV. Proposal Characteristics and Award Rates

### A. Proposal Characteristics

Proposals from the FY 1985 applicant population can be characterized as follows:

(1) Field of research and NSF program structure: Respondents were asked to name the program or division to which they applied (Q.6 of the survey) and to indicate their principal field of research (Q. 30). We categorized the program information using the set of research support divisions that existed in FY 1985 (note 5), and categorized fields using a modified version of a standard classification (note 6). The resulting table (Appendix C) is the first systematic look by program division at the research fields of campus-based individual investigators.

> For some fields, such as astronomy and mathematics, there is a very close correspondence with divisional structure; but significant numbers of investigators in chemistry and physics applied across the Foundation.

The last line of the table shows the relative volumes of proposals submitted by the surveyed population. In general, divisions in the Biological, Behavioral and Social Sciences Directorate and the Mathematics Division received two to three times the number of individual-investigator proposals as divisions in the physical and geophysical sciences, engineering and computer and information research. (As noted earlier, the survey excluded applicants representing centers, facilities and large groups -- who are more likely to apply to the latter divisions).

(2) New research vs. ongoing work (Q. 1 of the survey): 80% of respondents indicated that their proposal was a for research project not being funded by NSF at the time of submittal; 20% were competing for further funding of NSF-supported research.

Proposals for support of not-currently-funded work were more likely to be from younger applicants, women, persons resubmitting previously declined work, and those from primarily undergraduate institutions.

(3) New proposal vs. resubmittal (Q. 2): 29% of proposals decided upon during FY 1985 were resubmittals of previously declined proposals.

The highest resubmittal rates (greater than 40%) were to the Biotic Systems and Resources, Earth Sciences and Ocean Sciences Divisions. Resubmittal rates of 25% or lower were found in ten divisions, with the lowest rates in the Design, Manufacturing and Computer Engineering, Information Science and Technology, Atmospheric Sciences, Mathematics and Physics Divisions.

25% of proposals from women, and 29% of proposals from men, were resubmittals. There was very little variation by race or by year of highest degree. Applicants at primarily undergraduate institutions were slightly more likely (32%) to be resubmitting than those at doctoral institutions.

(4) First-time principal investigator (Q. 5): Overall, 29% of applicants said they were submitting their first proposal to NSF as independent principal investigators.

26% of the men and 51% of the women applicants were doing so (FY 1985 being the first year of a program for women investigators without prior support.) As expected, investigators who received their degrees mostrecently were more likely to be first-time PI's: 59% of those whose highest degrees were awarded since 1980 ("young investigators"); 29% of those in the 1970-79 cohort; 14% in the 1960-69 cohort; and 10% of those awarded their highest degree in 1959 or before were submitting for the first time as principal investigator.

(5) Multidisciplinary research (Q. 4): 29% indicated that their proposal was for support of multidisciplinary research.

Half of the proposals to the Division of Polar Programs were multidisciplinary; other divisions handling more than 37% of such proposals were Ocean Sciences, Information Science and Technology, and Social and Economic Sciences.

Divisions with 21% or fewer proposals described as multidisciplinary were Cellular Biology, Computer Research, Astronomy, Chemistry, Materials Research, Mathematics and Physics.

Very little difference was reported by first submittal vs. resubmittal, and no difference by sex. Applicants from undergraduate institutions and young investigators were slightly less likely to report their research proposal as multidisciplinary.

(6) Character of Research (Q.20): 53% of awardees agreed in the statement that "all or much" of the research being carried out under their award has "applied, practical or policy implications beyond the advancement of knowledge."

More than 75% of applicants to the five engineering divisions and two computer-related divisions characterized their research in this manner, compared with 23% of awardees in Astronomy and Physics.

Such implications were reported more frequently by young investigators, one-time awardees, persons with no reviewer experience, and Asian and other minority investigators.

Of the half of respondents to the above questions who answered a subsidiary question (Q.20A), about a quarter indicated that such implications were clear and immediate, half indicated they were fairly clear but long range, and a quarter felt that potential implications of this sort existed but were not clear.

(7) Amounts requested (Q. 8): Respondents reported the amount requested in their proposal on a yearly basis (to the nearest thousand dollars including indirect costs) in six categories:

| (Dollars in thousands) | <30 | 30-49 | 50-69 | 70-99 | 100-149 | >150 |
|---|---|---|---|---|---|---|
| % of proposals | 13% | 21% | 22% | 23% | 14% | 7% |
| % of awards | 16% | 20% | 20% | 23% | 15% | 7% |

Amounts requested differed considerably; for example 61% of Mathematics proposals, and 24% of those to the Social and Economic Sciences Division, requested less than $30,000; at the other end of the scale, 24% of proposals to the Physics Division and more than 11% of proposals to four other divisions requested more than $150,000. Younger investigators and those from primarily undergraduate institutions tended to request smaller amounts of money. The Foundation-wide distribution of awards by amount requested was almost the same. (Note: Amounts requested are generally higher than actual award amounts).

B. Award Rates by Division

Award rates by division are displayed in Appendix D. Chart (a) of the Appendix portrays "raw" award rates, i.e., FY 1985 awards divided by the sum of all award and decline decisions; these were calculated for the target population from NSF records (and used to adjust for the disproportionate number of survey responses from awardees).

For the Foundation as a whole, 34% of proposals from the surveyed population were awarded. Rates varied considerably by division: generally lower for the life sciences, social sciences and engineering divisions; and higher for the geosciences, computer sciences and physical sciences divisions.

By asking whether the proposal that respondents were reporting on was awarded or declined (Q.15) and whether it was a resubmittal (Q.2), we were able to construct the following profile:

(1) on first submittal (chart b): overall, 36% were funded. Again, rates varied considerably by division.

(2) on resubmittal (chart c): overall, 27% were funded. Rates varied by division, but not as much as with first submittals.

(3) eventually funded (chart d): the NSF-wide percentage of "traditional" research proposals eventually funded could be as high as 48%. The chart reflects this estimate, which was calculated by assuming that resubmittals are as common as the responses to Question 2 indicate. Question 15A suggests they may not be - (See VI. C below).

C. Award Rates by Other Proposal Characteristics

(1) Multidisciplinary proposals were awarded across the divisions at a rate of 30%. One division (Design, Manufacturing and Computer Engineering) awarded them at a rate 6% higher than is average rate, while a difference of 10% or more in favor of single-disciplinary proposals existed in the Computer Research, Information Science and Technology, Atmospheric Sciences, Polar Programs and Physics Divisions.

(2) First-time principal investigator: The Foundation-wide award rate was 29%, as compared with 36% for investigators applying for the second or later time. The rate for most divisions did not vary much from their division average. Two engineering divisions made awards to first-time investigators at higher rates than their division average and four (Information Science and Technology, Social and Economic Sciences, Earth Sciences and Physics) at somewhat lower rates.

V. Six Categories (Experience Classes) of Applicants

Recipients were asked to state (Q. 38) how many proposals they had submitted to NSF in the five years prior to completing the questionnaire (i.e., December 1982-1986), and how many were funded by the Foundation (Q. 39).

Based on their proposal/award histories, we have defined and named six categories of applicants:

(1) One-time awardee: 5% of applicants submitted one proposal during the five years preceding the survey, and it was awarded.

(2) Frequent awardee: 26% of applicants submitted two proposals, one of which was awarded; or three or more proposals, two or more (but not all) of which were awarded.

(3) Consistent awardee: 13% of applicants either received as many awards as proposals submitted (e.g., ranging from two proposals, two awards to five proposals, five awards) or received five or more awards over the five years, no matter how many proposals were submitted.

(4) One-time declinee: 13% of applicants submitted one proposal during the five years, which was declined.

(5) Frequent declinee: 14% of applicants submitted three or more proposals during the five years, only one of which was awarded.

(6) Consistent declinee: 28% of applicants submitted two or more proposals during the five years, and all were declined.

Characteristics of applicants by experience class are presented in Appendix E. Principal differences from the general population of surveyed applicants are as follows:

(1) Of one-time awardees, 21% were women compared with 13% of applicants generally. More were from the "top 21" institutions and fewer from the "other Ph.D.-granting" institutions. 12% of applicants with one proposal/one award were from the oldest group (highest degree in 1959 or before) and 29% were young investigators (highest degree since 1980).

7% or more of applicants to the following five divisions were one-time awardees: Social and Economic Sciences, Behavioral and Neural Sciences, Molecular Biology, Computer Research, and Information Science and Technology; one-time

awardees were least numerous (less than 2%) among applicants to three divisions: Ocean Sciences, Polar Programs, and Emerging and Critical Engineering Systems.

(2) Frequent awardees were slightly more likely than the average NSF applicant to be from one of the "top" institutions and slightly less likely to be "young investigators". 91% had served as a reviewer or panelist for NSF at least once in the five years before the survey.

They were more numerous among applicants to the geosciences divisions and to the Biological Systems and Resources, Astronomical Sciences, Information Science and Technology, Electrical, Communications and Systems Engineering and Chemical, Biochemical and Thermal Engineering Divisions. The smallest proportions were among applicants to four divisions of the Biological, Behavioral and Social Sciences Directorate.

(3) Consistent awardees were more likely than the average applicant to be male, older (19% with highest degrees prior to 1960 and 35% with degrees received in the 1960s), and much more likely to be associated with a "top 21" institution. 97% had served as a reviewer or panelist.

24% or more of applicants to six divisions were consistent awardees: Atmospheric Sciences, Polar Programs, Ocean Sciences, Astronomy, Mathematics and Physics; and 12% or fewer among applicants to all five divisions of the Biological, Behavioral and Social Sciences Directorate and four of the five Engineering divisions.

(4) 25% of one-time declinees were women; 18% were from primarily undergraduate institutions and 17% from "top 21" institutions; 29% were young investigators; and most (56%) had not served as a reviewer or panelist.

One-time declinees comprised 15% or more of the applicants to six divisions, four of them in the Biological, Behavioral and Social Sciences Directorate, one in Engineering (Mechanics, Structures and Materials) and the Research Initiation and Improvement Division. This group comprised between 5% and 7% of applicants to the five divisions of the Mathematical and Physical Sciences Directorate and between 2% and 6% of applicants to the four Geosciences divisions.

(5) 45% of frequent declinees were in one age cohort (highest degree in the 1970s).

The five Engineering divisions and the Divisions of Materials Research and Astronomical Sciences had the highest proportions (18% or more) of frequent declinees; and the lowest proportions (8% or less) were found among the Atmospheric Sciences, Social and Economic Sciences and Research Initiation and Improvement Divisions.

(6) Consistent declinees (the largest of the six classes of applicants) were more likely to be from "other Ph.D.-granting" institutions and less likely than the average applicant to have served as a reviewer or panelist. 43% received their highest degrees in the 1970s.

> More than 40% of the applicants to the Division of Cellular Biology were in this group, and more than 29% of applicants to seven other divisions: Behavioral and Neural Sciences, Biotic Systems and Resources, Molecular Biology, Electrical, Computer and Systems Engineering, Mechanics, Structures and Materials Engineering, Chemistry, and Mathematical Sciences. Consistent declinees comprised 20% or less of the applicants to the Information Science and Technology, Atmospheric Sciences, Polar Programs, Ocean Sciences and Astronomical Sciences divisions.

## VI. Actions Taken by Applicants

### A. Before Submitting Proposals (Q. 7)

As Appendix F shows, 52% of applicants telephoned someone at NSF to discuss a proposal before submitting it; 21% wrote, 13% visited the Foundation, and 4% submitted some form of preliminary proposal. 26% indicated that they knew the program officer prior to submittal. One-third had received a mailing from the Foundation, and 5% heard or spoke with someone from NSF who had visited their institution. In one-quarter of the cases, the applicant's institution handled all the contacts.

(1) The nature of the pre-proposal contact varied widely by program: applicants with more complex and costly proposals (e.g. in astronomy, atmospheric sciences, physics, oceanography, polar programs) were much more likely to have written a pre-proposal inquiry. More than a fifth of the applicants to engineering divisions visited NSF, but very few biologists wrote or visited. Half of the applicants to the Mathematical Sciences division had no personal contact with NSF (their institution handled all contacts).

(2) The amount and type of pre-proposal contact also differed greatly by the six experience categories: Frequent and consistent awardees were much more likely to have written, called or visited, and much less likely to have permitted their institution to handle all the contacts, than members of the other groups.

(3) Investigators who contacted NSF staff in some way prior to submitting a proposal were somewhat more likely to be funded than those who did not. (Note: The survey did not address the reasons for this outcome, but experience shows that in many cases investigators decide not to submit a proposal, and in other cases they are able to sharpen a proposal before submitting it).

(4) The likelihood of an award was much higher for applicants who said they knew the relevant program officer prior to submitting (many of whom had been frequent or consistent grantees).

Applicants to five divisions were most likely (>40%) to have known the program officer before applying: Atmospheric, Earth and Ocean sciences, Astronomy and Physics; and least likely (<14%) were applicants to the Cellular Biology, Molecular Biology, and Research Initiation and Improvement Divisions.

33% of those who had served as a reviewer or panelist indicated that they knew the program officer, compared with 7% of those who had not. Persons with reviewer/panelist experience were twice as likely to have visited, and slightly more likely to have called NSF before submitting.

(5) Young investigators were about as likely as other age groups to have telephoned, written, or read an NSF mailing. They were much less likely to have known the program officer or visited the Foundation, and more likely to allow their institution to make all the pre-proposal contacts.

(6) Applicants from undergraduate institutions were more likely to have written or telephoned, and much less likely to have known the program officer or to have visited NSF. They were also much less likely to have worked entirely through their institution's research support office.

B. Awareness of Alternative Programs

Three sets of questions (Q. 23, 24, 25) explored the degree of awareness about, and readiness to apply for support through, alternative channels for less-experienced women or minority investigators and for applicants of all sorts from undergraduate institutions (the programs of Research Opportunities for Women, Minority Research Initiation, and Primarily Undergraduate Institutions, respectively).

The majority of eligible respondents for all three programs did not submit their proposals through these channels, principally because they did not know about them at the time they applied.

In all three cases, eligible applicants who had served as reviewers once or more for NSF were somewhat less likely than those with no reviewer experience to have applied through an alternative program.

Applicants who were aware of, and eligible for, an alternative program but did not apply through it were asked to state their reasons. They most often volunteered that the specific program did not meet their needs, that their proposal fit better in another program, or that they expected the outcome to be more successful if their proposal were handled through regular channels.

(Note: The PUI program and the ROW program were relatively new at the time of the survey. Some unknown proportion of women applicants whose proposals were decided upon in FY 1985 had submitted them before the ROW program began in that year.

More detailed analysis of this set of questions was not undertaken because the numbers of persons responding were small.)

C. After Being Declined

Two-thirds of the proposals from the surveyed population were declined. When declinees were asked what actions they subsequently took with their proposal (Q. 15A):

-- 48% indicated they took no further action (presumably from the time of the declination to the time when they responded to the survey, anywhere from 14 to 26 months);

-- 25% resubmitted it to NSF, most with substantial revision;

-- 11% submitted it to another funding source with little or no revision;

-- 7% were in the process of developing a revised proposal; and,

-- less than 2% each were conducting the proposed research under another grant, conducting it without funding, deciding what step to take with their proposal, or seeking further information about the decision (answers could be multiple).

(1) Again, there were large differences among applicants to various divisions. For example:

> 10% of applicants to the Earth Sciences division, and 9% of those to Astronomical Sciences, said they resubmitted the declined proposal with little or no change, while in most divisions, less than 3% of applicants did so. Applicants to three biosciences divisions, two engineering divisions, Chemistry, and Materials Research were much more likely to have submitted the declined proposal to another agency, with or without revision.

(2) First-time declinees were much less likely to resubmit to NSF, and much more likely to take no further action, than other experience classes. Frequent awardees (and frequent declinees) were much more likely to resubmit, generally (but not always) with revisions.

(3) Applicants from various types of institutions and from various age groups did not show much difference in this regard.

(4) Women applicants were a little more likely than men to revise and submit to another agency (Note that women are relatively more numerous among bioscientists, who are more likely to do so).

(5) Minority applicants were less likely to have taken further action than Asian or white applicants.

Almost half the applicants indicated that they contacted the program officer to discuss the reasons for the declination (Q. 17).

(1) Post-declination contact varied considerably by experience category: 72% of the one-time declinees did not ask the program officer for an explanation (i.e., beyond receiving the verbatim reviews and, where applicable, panel summaries); frequent and consistent awardees were much more likely to do so.

(2) Those applying to the geosciences divisions were more likely, and those applying to the Mathematical Sciences, Social and Economic Sciences and Computer Research Divisions much less likely to have contacted the program officer.

(3) More than half of the applicants who had served as a reviewer or panelist contacted the program officer compared with about a third of those who had not.

(4) Minority applicants, women and applicants from undergraduate institutions were less likely to contact the program officer.

(5) Persons resubmitting a previously declined proposal were more likely to contact the program officer after it was for the second time declined.

82% of declinees said in response to Q. 18 that they were unaware of the Foundation's formal reconsideration procedure (explained in Appendix A). Percentages did not vary greatly among divisions, but they did range from higher to lower across the six experience categories, and with advancing "professional age"; i.e., the less experienced the applicant, the less he or she was likely to be aware of the possibility.

VII. Opinions About the Proposal Review System:

A. Overall Satisfaction (Q. 22)

Applicants were asked to indicate on a five-point scale how satisfied or dissatisfied they were with NSF's review process. Overall, 49% reported being satisfied or moderately satisfied, 14% were neutral, and 38% were dissatisfied or moderately dissatisfied.

(1) Four-fifths of awardees and one-third of declinees were satisfied; half of the declinees were dissatisfied with the review process.

(2) By experience: As the following table indicates, applicants' levels of satisfaction ranged in order of experience class from a low of 27% among consistent declinees to a high of 87% among one-time awardees:

| | Satisfied | Neutral | Dissatisfied |
|---|---|---|---|
| Consistent Declinee | 27% | 16% | 57% |
| One-time Declinee | 35% | 21% | 44% |
| Frequent Declinee | 40% | 16% | 44% |
| Frequent Awardee | 61% | 11% | 28% |
| Consistent Awardee | 83% | 5% | 12% |
| One-time Awardee | 87% | 7% | 6% |

(3) By division: The highest levels of satisfaction were among applicants to the Atmospheric Sciences (61%), Physics (58%) and Social and Economic Sciences (56%) Divisions; the lowest levels (from 34% to 43%) were among applicants to the five Engineering divisions.

(4) By review method: Levels of satisfaction did not differ significantly with respect to applicants to divisions that used panel review compared to divisions that employed mail review only.

(5) Resubmittal: 48% of persons resubmitting declined proposals were dissatisfied compared with 33% of applicants not doing so.

(6) By institution: Applicants from "top" institutions were slightly more likely to be satisfied, and those from primarily undergraduate institutions more likely to be dissatisfied.

(7) By "professional age": Not much difference, except that young investigators were a little more likely to be neutral.

(8) By sex: Almost no difference.

When respondents indicating dissatisfaction were asked to write in reasons, 92% wrote one or more. The reasons they volunteered, in order of frequency, were:

| | |
|---|---|
| -- reviewers or panelists not expert in the field, poorly chosen, poorly qualified | 18% |
| -- reviews were perfunctory, cursory, non-substantive | 17% |
| -- reviews were conflicting | 12% |
| -- cronyism, politics, "old boy's network" | 12% |
| -- decision was unclear or inconsistent with the reviews | 10% |
| -- reviews contained remarks considered biased, personal or intemperate | 7% |
| -- process is "unfair" (not further defined) | 7% |
| -- process is too slow | 5% |
| -- system biased against "innovative" proposals | 5% |
| -- system biased against particular research topics | 5% |
| -- program officer unqualified or inexperienced | 5% |
| -- system biased toward "big schools" | 4% |
| -- system biased against interdisciplinary proposals | 3% |
| -- proposal handled by wrong program | 2% |

(1) Awardees and declinees gave similar reasons in about the same order, except that 13% of dissatisfied awardees said that the review process was too slow, and dissatisfied declinees were slightly more likely to cite politics or cronyism.

(2) Nearly three times as many consistent declinees replied to this question as other types of applicants, and they were slightly more inclined to cite politics or cronyism.

(3) 10% of dissatisfied applicants from Primarily Undergraduate Institutions cited bias toward "big schools" as a source of their dissatisfaction, compared to 3% from doctoral institutions that were not in the "top 21". Dissatisfied PUI applicants were also a little more likely to cite politics or cronyism: 14% listed this as their first or second reason compared to 12% overall.

(4) Younger investigators were more likely to cite cursory reviews, and older investigators more likely to say that some reviewers had the wrong scientific background or were poorly chosen by the program officer.

(5) Applicants of Asian background were more likely to cite cursory reviews or poorly chosen/poorly qualified reviewers, while minority applicants were more likely to cite conflicting reviews, politics/cronyism or bias/personal remarks.

(6) Again, responses differed by division: One-fifth of applicants to the Division of Mathematical Sciences cited politics/cronyism compared with 4% of those to the Division of Polar Programs. But, as noted earlier, Mathematics applicants had the least pre-proposal contact of all NSF applicants and were twice as likely as the average applicant to allow their institutional research office to handle all interactions with the Foundation. The reverse was true of Polar Programs applicants.

In addition, 6% of dissatisfied respondents said NSF should offer a formal opportunity to rebut reviewers' remarks before the award/decline decision is made. This was particularly true among applicants to the Divisions of Mechanics, Structures and Materials Engineering, Polar Programs, Astronomy, Chemistry, Physics and Materials Research.

B. "Fairness" of Decisions to Decline

Question 16 asked declinees to indicate whether they thought the decision to decline their proposal was made fairly or unfairly; 60% thought the decision was "unfair".

(1) Among experience groups, 64% of consistent declinees, 63% of frequent declinees and 54% of one-time declinees held this view.

(2) The highest levels of perceived unfairness (65% or higher) were found among applicants to two of the four engineering divisions and to the Materials Research, Physics, Computer Research and Information Science and Technology divisions. The lowest levels (56% or lower) were among applicants to the Social and Economic Sciences, Behavioral and Neural Sciences, Oceanography and Chemistry Divisions.

(2) 68% of resubmitters thought the decision to decline their resubmitted proposal was unfair.

(3) The tendency to report unfairness increased with professional age; for example, 69% of those who received their highest degree in 1959 or before, compared with 56% of young investigators.

(4) Slightly more applicants from "top" institutions were likely to report the declination as unfair, and men were slightly more likely to so report.

(5) There was little difference among white and minority applicants, but applicants with Asian backgrounds were far more likely to indicate an unfair decision.

When those who indicated the declination was made unfairly were asked to state reasons, 58% of them did so. Their reasons were given about as often, and in about the same order, as the answers to the more general question about overall satisfaction. In addition, 4% of respondents to this question said that less important research than their proposal was funded, and 3% attributed the unfairness to "insufficient program funds".

C. Usefulness of Reviewers' Comments

Respondents were asked (Q. 21) how much the reviewers' comments helped them to understand the Foundation's decision. One-third said they helped a great deal, one-third found them somewhat helpful, and one-third said they were slightly or not helpful. Two-fifths of the declinees reported (Q. 15B) that the reviewers' comments substantially influenced their decision regarding the declined proposal, and another third said that the comments slightly influenced their decision.

More than two-fifths of the awardees reported (Q. 19) that the comments had influenced the research they subsequently conducted.

D. Views on Five Specific Statements (Q. 27)

Respondents were asked to what extent they agreed or disagreed (on a five-point scale) with five statements frequently made about the NSF proposal review system. Column one below indicates the percentage that agreed and column two the percentage that disagreed with each statement:

| | (A) | (D) |
|---|---|---|
| (a) (NSF's) review process makes it difficult for researchers to submit multidisciplinary proposals | 39% | 20% |
| (b) NSF should make greater use of grants that permit groups of researchers to band together in pursuing common research problems | 39% | 29% |
| (c) NSF is not likely to fund high-risk exploratory research because the likelihood of obtaining favorable reviews is slim | 67% | 13% |
| (d) In making awards NSF should place substantially more emphasis on the research history of the investigator, except for young researchers | 49% | 26% |
| (e) Proven researchers experience difficulty obtaining new awards when they apply for grants outside their disciplines | 52% | 8% |

Awardees and declinees tended to have different levels of agreement with the various statements. The highest level of agreement overall was with statement (c), but this was also the one about which awardees and declinees were most split, with 55% of awardees agreeing, compared with 74% of declinees.

Applicants who had some experience as reviewers for NSF were more likely to disagree with statements (a), (b) and (c) while non-reviewers were more likely to disagree with statement (d).

Applicants from undergraduate institutions were more likely to disagree with statements (d) and (e), while applicants from both groups of doctoral institutions were more likely to disagree with statements (a) and (b).

Older applicants were much more likely to agree, and younger applicants much more likely to be neutral about, statement (e). Older applicants were also much more likely to agree, and younger applicants more likely to disagree, with statement (d).

E. Preference for NSF vs. Other Funding Source

Applicants were asked (Q. 42) which Federal agency or other funding source is their first choice for support of their research. As might be expected, 66% cited NSF. Other agencies most often cited were The National Institutes of Health (15%), the Department of Defense and its various components (6%), and the National Aeronautics and Space Administration (2%).

(1) 79% of awardees and 59% of declinees indicated that NSF was their first choice for support. 10% of awardees and 18% of declinees cited NIH.

(2) The highest preference for NSF (92%) was among applicants to the Mathematical Sciences Division. Twelve other divisions had preference indicators of 75% or higher. For two divisions, Cellular Biology and Molecular Biology, more than half cited NIH as their first choice, as did 35% of the applicants to the Behavioral and Neural Sciences Division and 22% of those who applied to the Chemistry Division.

(3) DOD support was preferred by 10% to 21% of applicants to seven divisions, principally in areas of engineering, computer science and materials research. 21% of applicants to Astronomical Sciences and 12% of those to Atmospheric Sciences preferred NASA.

(4) 62% of the one-time declinees and 44% of the consistent declinees preferred other funding sources (principally NIH); 69% or more of the applicants in the other four experience categories preferred NSF.

When respondents were asked why the funding source they named was their first choice, 84% did so. The reasons they volunteered were as follows (in order by comments about NSF):

Percent Preferring:

| | NSF | DOD | NIH | NASA | Other |
|---|---|---|---|---|---|
| Agency supports basic research | 31% | 4% | 3% | 7% | 4% |
| Supports research "in my area" | 26% | 27% | 28% | 45% | 43% |
| Only funding source for my work | 13% | 2% | 1% | 2% | 2% |
| Flexibility in research goals | 10% | 3% | 2% | 3% | 3% |
| Fairer review process | 7% | 13% | 14% | 6% | 7% |
| More prestigious source | 6% | (others less than 1%) | | | |
| Fewer "strings" on the work | 5% | 3% | 1% | 2% | 1% |
| Prior success w/funding source | 5% | 10% | 10% | 10% | 12% |

Eleven other reasons were cited more than 1% of the time.

VIII. Excerpts from Selected Narrative Statements

The last question (Q. 43) on the survey form encouraged respondents to provide "any comments that you might have regarding the selection process of proposals as it operates at NSF." Half replied to the open-ended invitation, with comments ranging from one sentence ("Thanks for the money!") to several typewritten pages. Coding of the narratives was attempted but resulted in too many categories for analytic purposes; many respondents addressed several topics, while some placed them in the context of a narrative about their research career and their personal history of interaction with the Foundation.

The following 34 excerpts have been chosen to represent the diversity of issues raised in the narrative statements and to illustrate some of the points that resulted from analysis of the survey data.

(1) "NSF works about as well as can be expected...With a few exceptions...good science gets funded and mediocre science doesn't, which is all I ask."

--Frequent awardee with extensive reviewer experience.

(2) "Totally unfair as practiced by some program managers. They like to turn down proposals with high ratings as a justification for requests of increased budgets."

--Consistent declinee, little reviewer experience.

(3) "The peer review system, though flawed, is still the best, provided program directors make the effort to select true 'peers' (not easy, I'm sure). NSF is commonly perceived to be subject to 'good-old-boy' reviewing and as such, it is hard to convince unsuccessful applicants, especially younger ones, that their proposals were not funded simply because they didn't belong to the 'club.'"

--Frequent awardee, experienced reviewer.

(4) "The peer review system of NSF is the most rigorous and fairest system operative among government agencies. The worst systems are the 'old boy' networks of DOD, the Bureau of Mines and other agencies whose review system is largely internal. The weakest part of the NSF system is the panels, and I think that the system of panels should be abolished wherever possible..."

--Frequent declinee with some reviewer experience.

(5) "No system of reviewing is without faults. However, a system where all proposals in a given area are reviewed in common by the same panel, like that used at NIH or DOE, would at least lead to more consistent results."

--Frequent awardee, little reviewer experience.

(6) "Like many colleagues I have given up for now hope to get support from NSF... Compared with NIH reviews, with which I am familiar, the NSF reviews are superficial, sometimes incompetent, and the necessary balance between confidentiality of the review process and accountability of the reviewers is skewed too much toward the former; in other words, it is too easy for the reviewer to sink a proposal. The reviewers take a scientific disagreement with the ideas in the proposal as a reason for poor rating."

--Frequent declinee, no reviewer experience.

(7) "Process works better than that used by NIH. Use of a larger pool of ad hoc reviewers makes for a less parochial view of proposals."

--Frequent awardee, experienced reviewer.

(8) "The only problem I have had is the feeling that the reviewers were inappropriate for the proposals... This happens to have occurred in cases where, in my opinion, the proposed research was somewhat novel and probably did not fit into the particular program to which it was assigned. The reverse situation has been about as frequent -- the reviewers knew more about the proposed work than I did... There have also been cases where I disagreed with the conclusions of a review panel but two independent panels (at NIH and NSF) had the same objections."

--Frequent awardee, some reviewer experience.

(9) "I revised my proposal based largely on earlier reviewers' comments, and re-submitted a better proposal. That proposal was also turned down, but the reviewers' comments contained criticisms that weren't even mentioned by the first set of reviewers. Had they been mentioned the first time, I would have worked on revising those points also."

--Consistent declinee, little reviewer experience.

(10) "The peer review is basically sound. However, from time to time, problems arise because some reviewers' exhibit personal prejudices, particularly vis-a-vis competitors. At other times reviewers are inadequately informed or do not take the time to review the proposal adequately. This often results in ill-informed and hasty criticism and evaluation which has to be dealt with on an adversary basis. Other problems arise due to bureaucratic and political considerations within NSF... This is less frequent but when it happens it is difficult to deal with."

--One-time awardee with some reviewer experience.

(11) "Peer review is necessary to maintain the vitality of our national science effort. No other system seems to be obviously better or even as good. Problems with personal rivalries can be circumvented by a good program officer who knows the reviewers, and I have seen several examples."

--One-time awardee, considerable reviewer experience.

(12) "I recognize that NSF cannot support all requests but it's frustrating when the reviews are mixed, and therefore the proposal's not funded. We don't all agree on what the important research is at the moment. Many of us like to think we are ahead and it hurts to be cut down by comments like 'not interesting', 'not important'..."

--Consistent declinee, moderate reviewer experience.

(13) "I was quite surprised at the range of the reviews given my proposals. I don't know of any reasonable explanation for this lack of consistency, other than the fact that reviewers are human beings."

--Frequent declinee, no reviewer experience.

(14) "I work long and hard to write a proposal. I do not appreciate a one paragraph review, with no technical reasons given to support the reviewer's unfavorable opinion... I feel if you are going to reject a proposal you should give good reasons, and it is the program director's responsibility to ensure these are given."

--Consistent declinee, experienced reviewer.

(15) "When a proposal is rejected we get too little information on whether we should re-submit or not. Further, we get only modest feedback on how a rejected proposal could profitably be modified. This leads to a continuous cycle of (often fruitless) resubmissions. Tell the PI if there is little chance of funding a similar proposal. It's better to be discouraged than to put a lot of effort in, only to be rejected again".

--Frequent declinee, experienced reviewer.

(16) "Program directors have an inordinate influence on the type of research funded. Influence is exercised through selection of reviewers and panelists and interpretation of reviews. As program directors come and go, there are radical swings in what will and will not be funded."

--Consistent awardee, no reviewer experience.

(17) "The peer review process has served our profession and our nation well...Obviously, it can be 'maneuvered' by program managers at NSF but I believe they do a good, honest job and have made decisions which are correct and defensible."

--Frequent awardee, extensive reviewer experience.

(18) "NSF gave up its autonomy and its ability to fund the cutting edge of research when it let reviewers' ratings count for more than the program director's instinct and opinions. As a result, other funding agencies have, for years, openly said: 'If you have an original idea, bring it to us because NSF no longer funds new ideas'..."

--Frequent declinee, some reviewer experience.

(19) "Most program directors are quite good and are judicious in exercising authority to direct funding into certain areas. However, there have been certain situations where a program director was essentially lobbied by a colleague/ P.I. and funds redirected to that particular program. The assistant program directors have always, in my experience, been very professional in their conduct and have been most helpful."

--Infrequent awardee, moderate reviewer experience.

(20) "...given the interdisciplinary nature of my research, reviews of my proposals are often very narrowly conceived. Indeed, almost 40% of the reviews are critical of issues that are never raised or relevant to my proposals. I consider myself fortunate to have been treated fairly by the review panels. Nonetheless, I believe that the present system inhibits creative, multidisciplinary research."

--Frequent awardee, extensive reviewer experience.

(21) "Interdisciplinary programs are difficult to get funded because reviewers in each discipline criticize the other. Similarly, research proposals for work which does not fit into a particular program falls between the cracks and is difficult to get funded... Often the PI must make justifications in the proposals to make it appear that it fits. This weak link is frequently attacked by the reviewers..."

-- Frequent declinee, some reviewer experience.

(22) "Several of my proposals were mis-directed (either by myself or the NSF routing procedure). In at least one case, a proposal that was finally funded by one program had been rejected by another. This is despite the fact that the proposal was not changed and both NSF program panels had the same reviewers' comments to work from."

-- Frequent declinee, no reviewer experience.

(23) "NSF has always been very open and helpful in guiding me to appropriate programs for my work. I think the 'interactiveness' of the programs helps a lot in establishing a feeling of confidence that the work will be dealt with fairly. My good fortune has been in contrast to many of my close colleagues (three in my department, who happen also to be women). I don't fully understand why this has happened."

--Consistent awardee, little reviewer experience.

(24) "As funding gets tighter, reviews get more critical and rivalry intensifies. This can easily go past the point where good science is singled out for funding, and can soon drive good people from the field. This has happened in many fields, and is happening now in Britain. I see the seeds of a similar situation here..."

--Frequent awardee, moderate reviewer experience.

(25) "Less than one proposal in ten is being funded by the program... The effect on established researchers is quite serious, but the impact on new young faculty is a disaster... If this situation does not improve soon, then we will lose an entire generation of the best minds and future teachers in our universities... In times such as the present, where the success rate on proposals becomes ridiculously low, the reviewers all become nervous and supercritical because they know that a positive review severely diminishes their own chances of funding. Thus peer review becomes cutthroat, much innovative work is not funded, and even very good people become frustrated..."

--Consistent awardee, extensive reviewer experience.

(26) "I submitted an earlier proposal and got good to excellent ratings. But the resubmitted proposal, based on reviewers' comments, fared much lower. Additionally, there was a clear implication that my association with a small, liberal arts college was a liability...It seems that I will never gain a grant from NSF because of my association with an 'unknown', small institution. This is in spite of the fact that I publish regularly and am the editor of my professional journal."

--Consistent declinee, little reviewer experience.

(27) "The selection process at NSF is fair and efficient. However, I am very concerned about the limited support available for young investigators. I wish NSF would support new investigators to a larger extent, even though this means to take a great chance with respect to the success of the programs."

--Frequent declinee, extensive reviewer experience.

(28) "Greater emphasis should be placed on the track record, accomplishments, productivity of the principal investigator on previous grants. Too much time is spent in preparing proposals. This distracts form the performance of research. Older scientists should not be discriminated against if productivity is high."

--Frequent awardee, experienced reviewer.

(29) "The peer and panel review process is imperfect, but seems to be the best available. Narrowness and intolerance by the individuals involved is a problem. This is a fault in the way universities train students... Considerable effort is made to help beginning investigators, women, and minorities, faculty at undergraduate institutions, etc., and that is excellent. However, does it make sense to force out experienced investigators... some modest level of noncompetitive grants should be given, and all should pass through review at reasonable intervals."

--Frequent declinee, moderate reviewer experience.

(30) "Failure to gain significant amounts of grant support within the first few years of coming to my present position effectively ended all reasonable chance of ever gaining such support...I could not compete in productivity with those who had funds. Eventually, whatever reviewers might find meritorious in a proposal was countered by comments about low productivity...NSF should concentrate resources on making certain all young scientists in appropriate positions have an opportunity to initiate their studies. After a trial period continued support should be based on a reasonable level of productivity. Then we could do away with most of this ridiculous paper shuffling, half-baked results rushed into proposals to please reviewers, etc."

--Consistent declinee, no reviewer experience.

(31) "NSF panels generally take chances on young researchers and fund reliable superstars. The 75% of us inbetween these extremes are very likely to be dumped in mid-career by NSF."

--Frequent declinee, moderate reviewer experience.

(32) "After four years of NSF grants, being dropped had a devastating effect on my research. The preference toward juniors really depressed me...by penalizing quality researchers for falling from grace, the system discourages a lot of extremely radical ideas and directions."

--Frequent declinee, no recent review experience.

(33) "While exceedingly disappointed in the fate of my own submissions to NSF, I cannot imagine a better, more fair or more authoritative review process."

--Consistent declinee, little reviewer experience.

(34) "I can't imagine a process any better than peer review. It works in part because most reviewers take serious interest in their roles, in part because the people at NSF themselves are knowledgeable and of unquestioned integrity. It tends to break down when decisions are made on some basis outside of scientific merit (e.g., regional allocations of funds), are delayed or are not explained."

--Frequent declinee, moderate reviewer experience.

## IX. Additional Topics

### A. Proportion of Time Devoted to Research

Respondents were asked (Q. 33) to indicate roughly what proportion of their work time is devoted to various research, teaching and administrative activities. The applicant population as a whole divides its time as follows:

| | |
|---|---|
| Research, preparing proposals, related activities | 41% |
| Undergraduate instruction, preparation, advising | 21% |
| Graduate instruction, advising, consultation | 18% |
| Administrative duties to one's institution | 11% |
| Service to one's discipline (incl. as a reviewer) | 6% |
| Consulting or other outside employment | 2% |
| Other (unspecified) | 2% |

(1) The greatest differences were between applicants from the two sets of Ph.D.-granting institutions and those from primarily undergraduate institutions, as illustrated by the following:

(a) Time devoted to research and related activities:

| | 0-10% | 11-20% | 21-30% | 31-40% | 41% + |
|---|---|---|---|---|---|
| "top 21" | 4% | 10% | 22% | 22% | 42% |
| "other Ph.D." | 4% | 12% | 23% | 20% | 41% |
| Prim. Undergrad. | 22% | 24% | 23% | 14% | 17% |

(b) Time devoted to undergraduate instruction and related:

| | 0-10% | 11-20% | 21-30% | 31-40% | 41% + |
|---|---|---|---|---|---|
| "top 21" | 40% | 29% | 21% | 6% | 5% |
| "other Ph.D." | 34% | 25% | 24% | 9% | 9% |
| Prim. Undergrad. | 9% | 8% | 13% | 14% | 56% |

(2) By division: 50% or more of the applicants to five divisions (Cellular Biology, Molecular Biology, Atmospheric Sciences, Ocean Sciences and Physics) and 25% or fewer applicants to four other divisions (Computer Research and three engineering divisions) devote 41% or more of their time to research.

(3) Little difference was reported among awardees and declinees and among persons with or without reviewer experience. Women reported devoting slightly more time to research and less to consulting and administrative work.

B. Factors Hindering Progress in Research

In Q. 26, respondents were asked to indicate the degree to which each of six factors hindered progress in their own research. The factors and percent reporting them as a hindrance are:

| | |
|---|---|
| Shortages of capable graduate students | 47% |
| Shortages of research personnel | 46% |
| Inadequate equipment | 36% |
| Inadequate facilities | 29% |
| Unavailability of data | 17% |
| Insufficient theoretical models | 14% |

(1) In each category, declinees were more likely to report such hindrances than awardees, and applicants from undergraduate institutions were more likely to report shortages in the first four categories than those from other classes of institutions.

(2) Divisional percentages are fairly consistent with regard to shortages of graduate students, except that factor is cited more often by applicants to the Physics division and less often by applicants to Mathematical Sciences.

(3) Over half the applicants to the Astronomical Sciences division and to the four divisions that handle biosciences proposals cite shortages of research personnel. This factor was cited by 25% or fewer of the applicants to the Divisions of Polar Programs and Mathematical Sciences.

(4) Inadequate equipment is cited as a hindrance by more than 40% of the applicants to three engineering divisions, two geosciences divisions and three physical sciences divisions and by 15% or fewer applicants to the Mathematical Sciences and Social and Economic Sciences divisions. A similar pattern obtained for inadequacy of facilities.

(5) Unavailability of data was cited more frequently by applicants to the Social and Economic Sciences, Information Sciences and Polar Programs Divisions and least cited by those to the physical sciences divisions. Insufficient theoretical models were cited more often than the divisional average by applicants to Social and Economic Sciences, Astronomical Sciences and two engineering divisions.

X. Limitations of the Data and the Analysis

A. Nonrespondent bias:

An issue that commonly arises in surveys of this sort is whether nonrespondents would have given the same replies as those who did respond. 88% of awardees responded and 52% of declinees (a much larger group), following one blind postcard reminder. We have chosen not to sample non-respondents, for two reasons:

(1) To encourage candid replies, the survey forms were not coded or controlled to identify respondents. This renders controlled subsample selections impossible.

(2) While it would be possible to resurvey all declinees (since we have records of who was declined in FY 1985), or a smaller group based on asking whether they had responded to the earlier survey, the time and costs of doing so are substantial.

B. Two-way vs. many-way analysis of variables:

Most of the tables produced from the raw data are two-way tables, with some exceptions (e.g., the categorization of respondents by experience class, which was constructed from several variables). Other sorts of analyses could be performed. The data is available for such purposes -- see (1).

C. State in which applicant's institution is located:

We asked respondents to indicate the state in which their institution is located, but decided not to undertake the complex regressions necessary to isolate answers by individual state or groupings; it is not clear that such analysis would be useful given the powerful relationship of attitudes to proposal/award experience, research division, institution type and other factors.

The survey was designed by Jim McCullough, Bob Abel and Susan Queen of NSF's Program Evaluation Staff. The Center for Science and Technology Policy Studies of Abt Associates Inc. of (Cambridge, Mass.) undertook the mailings and compiled the data, under the direction of Stephen Fitzsimmons. Bob Abel developed computer programs and analyzed the data, with assistance from Bill Commins. Jim McCullough wrote the report, and Linda Rogers assisted with typing and preparation of appendices. The applicant classes are based on a suggestion by Carlos Kruytbosch of NSF's Science Resources Studies Division.

Notes:

1. A set of detailed tables, and information about the availability of data, may be requested from: NSF Program Evaluation Staff, Room 425, 1800 G St. N.W., Washington, D.C., 20550.

2. Many proposals acted upon in FY 1985 were submitted before the start of the year; also, many persons submitting proposals during the year were not surveyed because the Foundation's decision about their proposal was made later.

3. The complete list is shown in Q. 25 of Appendix G.

4. This included persons who applied through an independent research organization (e.g., SRI International, Carnegie Institution, Field Museum) or as individuals not associated with an institution.

5. But placed in the current (FY 1987) Directorate matrix for clarity. Principal changes are the shift of the Divisions of Computer Research and Information Science and Technology to the since-established CISE Directorate, and the transfer of the Division of Astronomical Sciences to the MPS Directorate.

6. Principally by adding "Materials Research" and "Information Science and Technology" as fields.

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**APPENDIX A: NSF PROPOSAL REVIEW AND DECISION MAKING PROCEDURES**

Most proposals received by the Foundation are unsolicited; the research ideas and methods are those of the applicants. Proposals are assigned to a program officer who oversees external review, evaluates reviewers' comments, and makes a recommendation to award or decline it, taking into account other considerations -- such as the relationship of the work to the field as a whole and to other pending proposals, and the program's purposes and budget.

The program officer's recommendations are reviewed at one or more supervisory levels. In a few cases, they are further reviewed by the National Science Board. Specialists in the Division of Grants and Contracts then check on all the nonscientific aspects of the award and issue the formal notification to the applicant's institution.

The specific review procedure depends on the tradition of the field: in the physical sciences, engineering, and some geosciences programs, proposals are usually mailed to reviewers who respond individually; in the biological and social sciences and some geosciences programs a panel reviews the proposal in addition to the mail reviewers. For large projects and special competitions of various types reviews are often supplemented with site visits by teams of reviewers and staff.

In the mail-out procedure, the proposal is sent to several people -- sometimes as many as ten -- identified by the program officer as knowledgeable on the topic. The reviewer receives standard instructions and forms and responds directly to the program officer. Where panels are used, they meet at some specified interval (generally three times a year in the larger programs) to weigh a group of proposals, taking into account the prior mail reviews. On average, a proposal has the benefit of 5.5 completed external reviews.

The Foundation-wide criteria for proposal selection are published in NSF's "Grants for Scientific and Engineering Research and Education". They are meant to be applied to all proposals "in a balanced and judicious manner":

(1) Research performance competence: technical capability of investigators(s) and adequacy of institutional resources;

(2) Intrinsic merit: extent to which the proposed work is expected to lead to new discoveries or fundamental advances in its field or across fields;

(3) Utility or relevance: extent to which it could contribute to an extrinsic goal such as a new technology; and

(4) Effects on the infrastructure of science and engineering: what the work will contribute to the Nation's research, education and human resource base.

The relative weights of criteria (2) and (3) depend on the character of the work. The fourth criterion allows the program to take into account such matters as the participation of women and minorities, institutional distribution, and the stimulation of important but underdeveloped research areas. In many cases programs also use special criteria related to their purpose as in, for example, programs for equipment grants or visiting professorships for women.

Several safeguards are built in to ensure an open and fair system:

(1) Conflicts of Interest: Reviewers and program officers are asked to identify any academic affiliations, personal relationships or financial interests that could constitute or be regarded as a conflict, and to withdraw from the decision process if warranted.

(2) Verbatim Reviews: All reviews are routinely sent to the proposer, but without attribution to individual reviewers. Where panels are employed, summaries of their deliberations are also provided.

(3) Formal Reconsideration: At the applicant's request, reconsideration may be carried out by persons not involved in the earlier decision. This is not a "de novo" review of the scientific merits but an examination of how the case was handled by the program officer. An applicant not satisfied with the first reconsideration may have his or her institution request a further reconsideration by the Foundation's deputy director.

(4) Sampling: The Director's Office of Audit and Oversight routinely samples actions for compliance with Foundation procedures and provides direct feedback to the program division.

(5) External Peer Oversight: Each program is given a comprehensive review every three years by a small group of external peers familiar with the field. These "visiting committees" make formal reports to the NSF Director. The reports, and the annual summary, are available to the public.

(6) Analyses of Decision Patterns: The Director's Program Evaluation Staff runs statistical tests to see how the system has treated various classes of applicants.

## APPENDIX B: NSF RESEARCH SUPPORT ORGANIZATION

NOTE: FY 1985 Divisions included in survey, placed in FY 1987 Directorate Structure.

| Abbreviation | Organization |
|---|---|
| BBS | Biological, Behavioral and Social Sciences Directorate |
| BNS | Behavioral and Neural Sciences |
| BSR | Biotic Systems and Resources |
| DCB | Cellular Biosciences |
| DMB | Molecular Biosciences |
| SES | Social and Economic Sciences |
| CISE | Computer and Information Science & Engineering Directorate |
| DCR | Computer Research |
| IST | Information Science and Technology |
| ENG | Engineering Directorate |
| CBT | Chemical, Biochemical, and Thermal Engineering |
| DMC | Design, Manufacturing, and Computer-Integrated Eng. |
| ECE | Electrical, Communications, and Systems Engineering |
| MSM | Mechanics, Structures, and Materials Engineering |
| ECES | Emerging and Critical Engineering Systems |
| GEO | Geosciences Directorate |
| ATM | Atmospheric Sciences |
| DPP | Polar Programs |
| EAR | Earth Sciences |
| OCE | Ocean Sciences |
| MPS | Mathematical and Physical Science Directorate |
| AST | Astronomical Sciences |
| CHE | Chemistry |
| DMR | Materials Research |
| DMS | Mathematical Sciences |
| PHY | Physics |
| STIA | Scientific, Technological and International Affairs Directorate |
| RII | Research Initiation and Improvement |

APPENDIX C: Number of Proposals by Field of Research and by NSF Division

| Respondents' Field of Research | BBS BNS | BBS BSR | BBS DCB | BBS DMB | BBS SES | CISE DCR | CISE IST | ENG CBTE | ENG DMCE | ENG ECES | ENG ECSE | ENG MSME | ENG OTH | GEO ATM | GEO DPP | GEO EAR | GEO OCE | MPS AST | MPS CHEM | MPS DMR | MPS DMS | MPS PHY | STIA RII | (2) NONE | Totals by field |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Computer Science | | | | 1 | 2 | 318 | 38 | | 80 | 2 | 17 | | 1 | | | | | | 2 | | 11 | 2 | 12 | 45 | 531 |
| Chem. Eng. | | | 2 | 6 | 1 | 2 | | 304 | 1 | 5 | | 9 | 30 | | | | | | 11 | 8 | 1 | | 18 | 29 | 427 |
| Civil Eng. | 1 | 1 | | 1 | 5 | | | 5 | 12 | 171 | 2 | 105 | 24 | | | 3 | | | 2 | 5 | | | 3 | 23 | 364 |
| Elect. Eng. | 2 | 1 | | 4 | | 10 | | 17 | 44 | 16 | 268 | 8 | 27 | 3 | 2 | 1 | | 1 | 2 | 10 | 2 | 2 | 23 | 34 | 476 |
| Mech. Eng. | | | | 2 | | | 1 | 127 | 31 | 21 | 9 | 259 | 19 | 7 | 4 | 2 | 3 | 2 | 2 | 11 | 1 | | 28 | 35 | 565 |
| Eng. Other (1) | 5 | 2 | 2 | 4 | 5 | 9 | 2 | 56 | 75 | 108 | 66 | 114 | 33 | 4 | 2 | 1 | 3 | | | 18 | 8 | | 11 | 66 | 592 |
| Atmospheric Sci. | | | | | 1 | | | | | | | | | 145 | 8 | 3 | 5 | 1 | 1 | | 2 | | | 4 | 170 |
| Earth Sci. | 8 | 25 | 1 | 3 | 11 | | 1 | | | 10 | | | 2 | 3 | 57 | 483 | 39 | | | | | | 11 | 39 | 693 |
| Ocean Sci. | 4 | 13 | 1 | 5 | | | | | | 2 | | 2 | | 10 | 23 | 10 | 395 | | 3 | 2 | | 2 | 8 | 22 | 501 |
| Geo. Sci. Other (1) | 7 | 11 | 4 | | 6 | | | | 3 | 14 | | | 5 | 17 | 9 | 62 | 17 | | 2 | | | | 1 | 18 | 177 |
| Information S&T | 1 | | | | 4 | 3 | 29 | | | | | | | | | | | | | | 1 | | 8 | 6 | 53 |
| Biochemistry | 31 | 3 | | 339 | | | | 3 | | 2 | | | 2 | | | 3 | 3 | | 13 | 2 | 2 | | 13 | 68 | 608 |
| Cell/Molec. Bio. | 14 | 18 | 124 | 119 | | | | | | | | | | | | | | | 4 | | | | 15 | 20 | 403 |
| Ecology/Env. Bio. | 14 | 224 | 213 | 4 | 5 | | | | | 4 | | 1 | | | 5 | 4 | 21 | | | | | | 10 | 9 | 302 |
| Medical Sci. | 143 | 6 | 2 | 22 | 4 | 2 | | | | | | 1 | 4 | | 6 | | 3 | | 3 | 2 | | 2 | 22 | 50 | 437 |
| Microbiology | 3 | 22 | 170 | 66 | 1 | | | 2 | | 5 | | | | 2 | 4 | | 7 | | 2 | | | | 8 | 12 | 177 |
| Life Sci. Other (1) | 267 | 482 | 45 | 229 | 9 | | 7 | 4 | | 11 | 2 | 2 | | 1 | 16 | 7 | 40 | 2 | 3 | 1 | 4 | 3 | 66 | 131 | 1678 |
| Psychology | 314 | 2 | 393 | 1 | 49 | | 11 | | | 3 | | 2 | | | | | | | | | | | 16 | 46 | 449 |
| Zoology | 11 | 51 | 3 | 3 | | | | | | | | | | | | | 3 | | | | | | 1 | 14 | 110 |
| Mathematics | 4 | 1 | 27 | 1 | 13 | 16 | 5 | 2 | 1 | 2 | 12 | 7 | | 2 | | | | | 3 | 3 | 966 | 2 | 23 | 60 | 1121 |
| Astronomy | | | | | | | | | | | | | | 36 | 3 | | | 148 | | | | | 1 | 7 | 197 |
| Chemistry | 30 | 8 | 2 | 99 | | | | 34 | | 11 | 2 | 6 | 12 | 13 | 5 | 9 | 4 | | 720 | 115 | 1 | 8 | 27 | 153 | 1268 |
| Materials Research | 6 | | 10 | 2 | | | | 2 | | | 3 | 9 | | | | 1 | | | 2 | 143 | | 2 | 8 | 16 | 194 |
| Physical Other (1) | 3 | 2 | | 11 | 2 | 2 | | 4 | | 2 | 3 | | 1 | 28 | 8 | 96 | 11 | 14 | 6 | 15 | 2 | 7 | | 18 | 242 |
| Physics | 5 | | 6 | 10 | 3 | | | 17 | | 2 | 30 | 8 | 7 | 57 | 16 | 5 | 5 | 16 | 22 | 248 | 8 | 235 | 8 | 63 | 770 |
| Anthropology | 266 | 5 | 5 | 1 | 3 | | | | | | | | 2 | | | 1 | | | | 1 | | | 7 | 9 | 298 |
| Economics | 5 | 3 | 2 | | 287 | | 21 | | | | | | | | | | | 2 | | | 2 | | | 18 | 338 |
| Soc. Sci. Other (1) | 99 | 11 | | | 242 | | 5 | | | 5 | | | 1 | | 2 | 3 | | | | 2 | 2 | | 46 | 19 | 437 |
| Political Science | 3 | | | | 132 | | | | | 2 | | | | | | | | | | | | | 7 | 12 | 155 |
| Sociology | 3 | 1 | | | 124 | | 5 | | | 3 | | | | | | | | | | | | | 24 | 7 | 168 |
| Misc. Other (1) | 38 | 16 | 5 | 3 | 18 | | 2 | 2 | | | 2 | | 1 | 3 | 2 | 26 | 5 | 5 | 1 | 5 | 1 | | 23 | 14 | 173 |
| Totals by Division | 1285 | 907 | 1015 | 935 | 929 | 362 | 128 | 580 | 248 | 399 | 418 | 531 | 170 | 330 | 172 | 722 | 564 | 193 | 799 | 592 | 1012 | 263 | 448 | 1070 | 14072 |

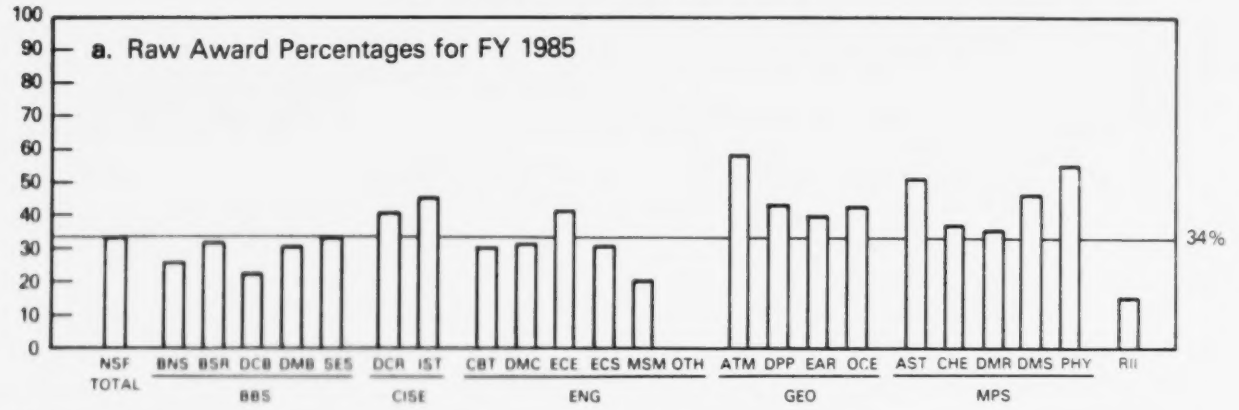
Notes:

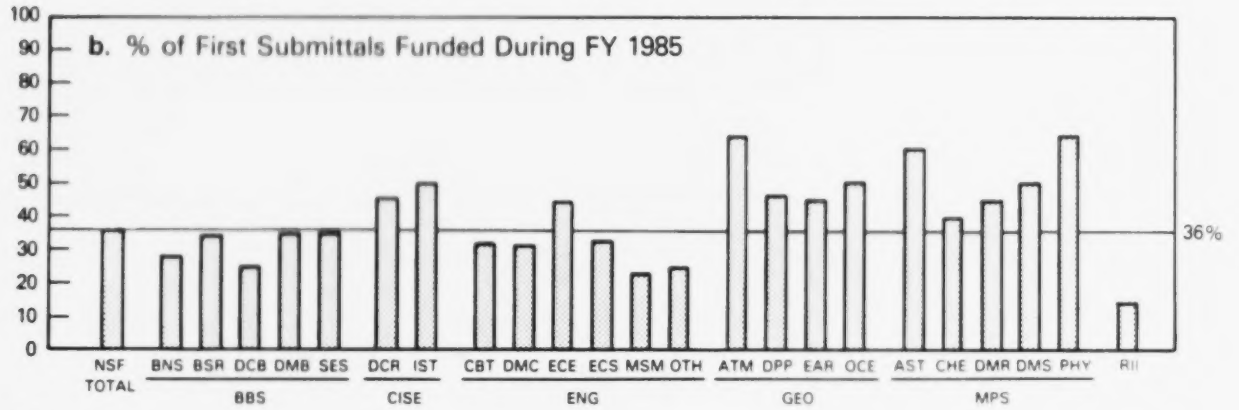
(1) Respondents did not identify specific field; also includes fields for which a small number of responses were given (e.g., Aeronautical Engineering).

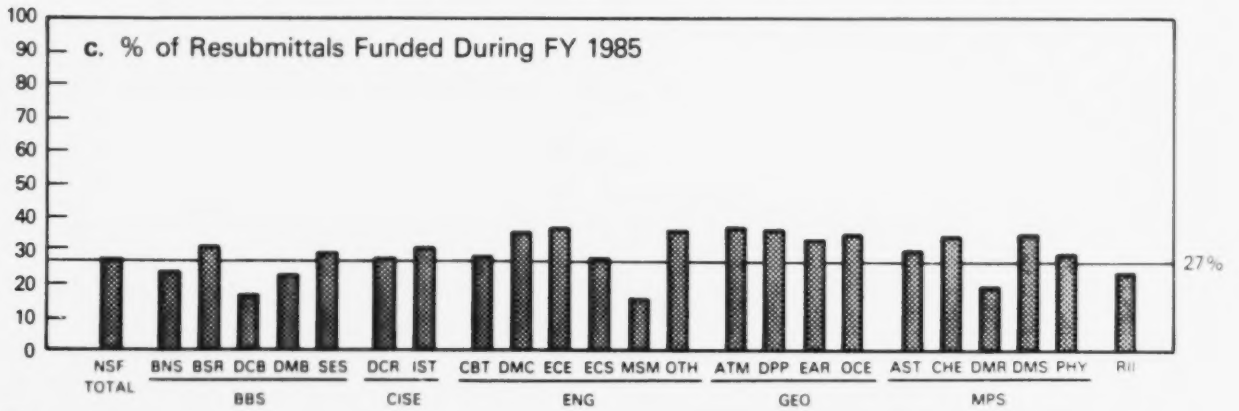
(2) Program or division not reported or not identified.

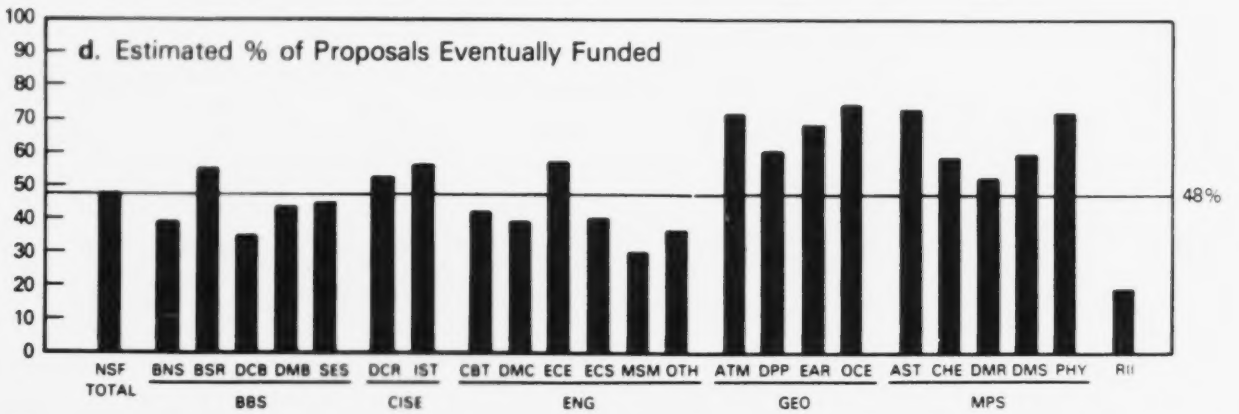
# Percent of Proposals that are Eventually Funded by Research Divisions

APPENDIX D



Appendix E: Characteristics of Applicants by Experience Class

| | Sex | | Race | | | Institution | | | | Professional Age | | | | Rev'r | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | M | F | W | A | M | 21 | Ph.D. | PUI | Other | >59 | 60s | 70s | 80s | Y | N |
| One-Time Awardee: | 79% | 21% | 90% | 8% | 2% | 29% | 52% | 12% | 7% | 12% | 22% | 37% | 29% | 80% | 20% |
| Frequent Awardee: | 89% | 11% | 88% | 10% | 2% | 28% | 58% | 8% | 6% | 11% | 28% | 43% | 16% | 91% | 9% |
| Consistent Awardee: | 94% | 7% | 92% | 7% | 2% | 37% | 54% | 4% | 5% | 19% | 35% | 37% | 8% | 97% | 3% |
| One-Time Declinee: | 75% | 25% | 90% | 8% | 2% | 17% | 61% | 18% | 5% | 12% | 23% | 37% | 29% | 44% | 56% |
| Frequent Declinee: | 91% | 9% | 88% | 10% | 2% | 22% | 65% | 9% | 4% | 9% | 26% | 45% | 20% | 83% | 17% |
| Consistent Declinee: | 87% | 13% | 88% | 10% | 2% | 14% | 68% | 14% | 4% | 8% | 25% | 43% | 24% | 62% | 38% |
| Survey Universe: | 87% | 13% | 89% | 9% | 2% | 23% | 62% | 11% | 4% | 11% | 26% | 41% | 21% | 75% | 25% |

## APPENDIX F: EXTENT OF PRE-PROPOSAL CONTACT

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| Overall | 33% | 21% | 52% | 13% | 5% | 26% | 5% | 25% |
| Award | 32 | 23 | 58 | 16 | 6 | 37 | 4 | 20 |
| Decline | 34 | 20 | 49 | 11 | 5 | 21 | 5 | 27 |
| Experience with NSF | | | | | | | | |
| 1Time Awardee | 32 | 21 | 52 | 13 | 5 | 25 | 5 | 24 |
| Freq. Awardee | 31 | 23 | 61 | 19 | 5 | 42 | 5 | 18 |
| Cons. Awardee | 29 | 23 | 59 | 18 | 6 | 48 | 4 | 19 |
| 1Time Declinee | 37 | 22 | 46 | 5 | 4 | 10 | 5 | 29 |
| Frequent Declinee | 35 | 19 | 54 | 14 | 6 | 28 | 3 | 24 |
| Cons. Declinee | 35 | 18 | 46 | 10 | 6 | 15 | 4 | 30 |
| Division | | | | | | | | |
| BBS-BNS | 28 | 26 | 57 | 6 | 3 | 26 | 4 | 25 |
| BBS-BSR | 36 | 22 | 58 | 14 | 5 | 21 | 3 | 23 |
| BBS-DCB | 28 | 16 | 53 | 7 | 3 | 11 | 1 | 30 |
| BBS-DMB | 32 | 17 | 47 | 8 | 2 | 14 | 2 | 32 |
| BBS-SES | 35 | 31 | 56 | 12 | 4 | 28 | 8 | 21 |
| CISE-DCR | 32 | 18 | 38 | 13 | 3 | 28 | 2 | 37 |
| CISE-IST | 50 | 31 | 64 | 24 | 4 | 20 | 17 | 10 |
| ENG-CBTE | 26 | 16 | 47 | 15 | 7 | 30 | 4 | 22 |
| ENG-DMCE | 37 | 16 | 46 | 26 | 7 | 24 | 5 | 24 |
| ENG-ECES | 32 | 21 | 53 | 27 | 9 | 39 | 8 | 17 |
| ENG-ECSE | 27 | 18 | 42 | 20 | 7 | 22 | 5 | 31 |
| ENG-MSME | 34 | 13 | 46 | 22 | 3 | 22 | 4 | 28 |
| ENG-OTHER | 46 | 13 | 35 | 18 | 5 | 20 | 5 | 22 |
| GEO-ATM | 17 | 28 | 73 | 25 | 3 | 55 | 9 | 10 |
| GEO-DPP | 34 | 28 | 70 | 21 | 5 | 44 | 5 | 9 |
| GEO-EAR | 30 | 16 | 56 | 8 | 5 | 33 | 2 | 27 |
| GEO-OCE | 26 | 20 | 64 | 23 | 9 | 55 | 6 | 16 |
| MPS-AST | 20 | 19 | 64 | 17 | 4 | 47 | 4 | 10 |
| MPS-CHEM | 40 | 23 | 53 | 13 | 7 | 36 | 3 | 20 |
| MPS-DMR | 33 | 23 | 68 | 20 | 4 | 33 | 4 | 10 |
| MPS-DMS | 28 | 13 | 31 | 4 | 8 | 21 | 1 | 51 |
| MPS-PHY | 21 | 26 | 68 | 21 | 3 | 41 | 6 | 13 |
| STIA-RII | 66 | 25 | 49 | 7 | 20 | 12 | 20 | 20 |
| NONE-OTHER | 47 | 22 | 49 | 10 | 4 | 13 | 4 | 24 |
| Year of Highest Degree | | | | | | | | |
| 1959/before | 30 | 24 | 49 | 17 | 3 | 36 | 6 | 21 |
| 1960-69 | 32 | 21 | 53 | 17 | 5 | 33 | 5 | 22 |
| 1970-79 | 35 | 21 | 55 | 12 | 6 | 25 | 5 | 24 |
| 1980-87 | 34 | 17 | 48 | 9 | 6 | 15 | 3 | 32 |
| Male | 32 | 21 | 52 | 14 | 5 | 27 | 5 | 25 |
| Female | 40 | 22 | 56 | 9 | 6 | 21 | 4 | 23 |
| Resubmission | 33 | 24 | 59 | 16 | 6 | 27 | 5 | 21 |
| 1st Submission | 34 | 20 | 50 | 12 | 5 | 26 | 4 | 26 |
| Institution | | | | | | | | |
| "Top 21" | 27 | 19 | 50 | 13 | 4 | 35 | 5 | 28 |
| "Phd-Other" | 32 | 20 | 52 | 13 | 5 | 25 | 4 | 26 |
| Undgrad | 52 | 26 | 56 | 7 | 8 | 14 | 5 | 16 |
| Other | 38 | 25 | 57 | 22 | 5 | 28 | 9 | 15 |
| Race/Ethnicity | | | | | | | | |
| Asian | 28 | 17 | 40 | 12 | 5 | 16 | 3 | 35 |
| Minority | 34 | 20 | 49 | 15 | 14 | 20 | 3 | 20 |
| White | 34 | 21 | 54 | 13 | 5 | 28 | 5 | 24 |
| Reviewer | 32 | 21 | 55 | 15 | 5 | 33 | 5 | 23 |
| Not Reviewer | 39 | 20 | 46 | 7 | 5 | 7 | 4 | 30 |

KEY:

(1) Received NSF mailing
(2) Wrote NSF
(3) Telephoned NSF
(4) Visited NSF
(5) NSF Visited Institution
(6) Knew Program Officer
(7) Submitted Preliminary Proposal
(8) Institution Handled all Contacts

NATIONAL SCIENCE FOUNDATION
WASHINGTON, D.C. 20550

OFFICE OF THE
DIRECTOR

APPENDIX G: SURVEY FORM

October 31, 1986

Dear Colleague:

We at the Foundation value the views of the communities we serve and make every effort to take them into account in designing and operating our programs.

We are now surveying investigators whose proposals for research support were awarded or declined last year, to see how well our proposal review system is working and whether information about particular programs is reaching potential applicants.

Please take twenty or thirty minutes to complete the enclosed survey and return it in the postpaid envelope. A few of the questions solicit your written comments, and I encourage you to provide them. Survey results will be presented to me, to the National Science Board, and to Foundation managers and staff as we consider ways to improve our programs and management systems.

I hope you will not hesitate to answer frankly and thoughtfully. The survey is designed so that individual responses cannot be associated with any person, institution or proposal. Replies will be processed by an organization outside NSF reporting directly to the Program Evaluation Staff, a part of my office. NSF program directors and other audiences will receive general, summarized information but will not see your reply or those of any other respondent.

Thank you for taking part in this effort. I am certain that the information from this survey will be useful to the Foundation, and I look forward to hearing from you.

Erich Bloch
Director

OMB No. 3145-0098
Expiration Date: 1/31/87

SURVEY OF NSF RESEARCH APPLICANTS

You have been selected for this survey because you submitted a research proposal to NSF that was awarded or declined between October 1, 1984 and September 30, 1985. We would like to know your opinions about the procedures used to review that proposal. If you had more than one proposal awarded or declined during that time, please answer the following questions with regard to the last of those proposals about which a decision was made.

1. Was the proposal that you submitted: CIRCLE ONE

| | | |
|---|---|---|
| A new proposal for work not currently supported by NSF | 1 | 80% |
| A proposal for further funding of ongoing NSF-supported work | 2 | 20% |

2. Was the proposal a modification of a proposal previously declined by NSF?

| | | |
|---|---|---|
| Yes | 1 | 29% |
| No | 2 | 71% |

3. Was this proposal <u>principally</u> for support of: CIRCLE ONE

| | | |
|---|---|---|
| Research | 1 | 92% |
| Equipment/Facilities | 2 | 5% |
| Industry-University Cooperative Research | 3 | 1% |
| Other, PLEASE SPECIFY _____ | 4 | 1% |

4. Was this proposal for support of multidisciplinary research?

| | | |
|---|---|---|
| Yes | 1 | 29% |
| No | 2 | 71% |

5. Was this the first NSF proposal for which you served as the principal investigator? CIRCLE ONE

| | | |
|---|---|---|
| Yes | 1 | 29% |
| No | 2 | 71% |

6. Which NSF program handled your proposal?
(If program unknown, specify NSF division or directorate)

Program_____

7. How were you in contact with NSF prior to submitting your proposal? PLEASE CIRCLE ALL THAT APPLY.

| | | |
|---|---|---|
| Received an NSF mailing | 1 | 33% |
| Wrote to NSF | 2 | 21% |
| Phoned NSF | 3 | 52% |
| Visited NSF | 4 | 13% |
| NSF came to my institution with a presentation | 5 | 5% |
| Knew a program officer | 6 | 26% |
| Sent in a preliminary informal proposal | 7 | 4% |
| Other, PLEASE SPECIFY_____ | 8 | 2% |
| My institution's research support office handled all contacts | 9 | 25% |

8. What was the amount of money requested in your proposal <u>on a yearly basis</u>, including indirect costs? CIRCLE ONE

| | | |
|---|---|---|
| Less than $30,000 | 1 | 13% |
| $30,000 - $49,999 | 2 | 21% |
| $50,000 - $69,999 | 3 | 22% |
| $70,000 - $99,999 | 4 | 23% |
| $100,000 - $149,999 | 5 | 14% |
| Over $150,000 | 6 | 7% |

9. Which of the following review procedures were used for that proposal? PLEASE CIRCLE ALL THAT APPLY.

| | | |
|---|---|---|
| Mail Review | 1 | 76% |
| Panel Review | 2 | 42% |
| Pre-Award Site Visit | 3 | 1% |
| Don't Know | 4 | 16% |

10. Approximately how many months elapsed from when you or your institution sent the proposal to NSF until you received the Foundation's official letter conveying its decision? ENTER NUMBER OF MONTHS.

| Months | | |
|---|---|---|
| Average | = | 7.4 months |
| 25th percentile | = | 6 months |
| 75th percentile | = | 9 months |

11. Was processing of your proposal delayed because it lacked information required by NSF such as signatures or the statement about current and pending support?

| | | |
|---|---|---|
| Yes | 1 | 1% |
| No | 2 | 95% |
| Don't know | 3 | 4% |

12. Did you receive informal notification of the decision on your proposal before you received the official notification letter?

| | | |
|---|---|---|
| Yes | 1 | 56% |
| No | 2 | 44% |

13. How much time elapsed from the time you learned of the decision on your proposal until you received the reviewers' comments? CIRCLE ONE

| | | |
|---|---|---|
| Received reviewers' comments at same time I learned of the decision | 1 | 37% |
| One month or less | 2 | 36% |
| More than one Month (ENTER THE NUMBER OF MONTHS). Months_____ | 3 | 24% |
| Did not receive reviewers' comments | 4 | 4% |

14. If you summed up the rating of your proposal by the reviewers, which of the following categories would come closest to describing their overall rating? CIRCLE ONE

| | | |
|---|---|---|
| Excellent | 1 | 6% |
| Very Good to Excellent | 2 | 34% |
| Very Good | 3 | 25% |
| Good to Very Good | 4 | 19% |
| Good | 5 | 9% |
| Fair to Good | 6 | 5% |
| Fair or Lower | 7 | 2% |

15. Was the proposal you submitted to NSF awarded or was it declined? CIRCLE ONE

| | |
|---|---|
| Awarded (SKIP TO Q. 19).....1 | 34% |
| Declined.....2 | 66% |

15A. What did you subsequently do with your proposal? CHECK ALL THAT APPLY

| | |
|---|---|
| Resubmitted to NSF with substantial revision.....1 | 21% |
| Resubmitted to NSF with little or no revision.....2 | 3% |
| Submitted it to another funding source with substantial revision.....3 | 11% |
| Submitted it to another funding source with little or no revision.....4 | 11% |
| Did not take further action on the proposal.....5 | 48% |
| Other, PLEASE SPECIFY_____6 | 14% |

15B. To what degree did the reviewers' comments influence your decision regarding what you did with your proposal? CIRCLE ONE.

| | |
|---|---|
| Substantially.....1 | 41% |
| Slightly.....2 | 32% |
| Not at all.....3 | 25% |
| Did not receive comments.....4 | 2% |

16. If your proposal was declined, do you think the decision was made fairly?

| | | |
|---|---|---|
| Yes-Made Fairly | 1 | 40% |
| No-Not Made Fairly | 2 | 60% |

16A. Why do you think that the decision was not made fairly?

( 96% of those who indicated "not fairly" stated their reasons )

17. If your proposal was declined, did you contact the program officer to discuss the reasons?

| | | |
|---|---|---|
| Yes | 1 | 47% |
| No | 2 | 53% |

18. Were you aware that NSF has a formal reconsideration process?

| | | |
|---|---|---|
| Was aware (SKIP TO Q. 21) | 1 | 18% |
| Was not aware (SKIP TO Q. 21) | 2 | 82% |

19. If your proposal was awarded, to what extent did the reviewers' comments influence the research that was subsequently conducted? CIRCLE ONE

| | | |
|---|---|---|
| Substantial influence | 1 | 5% |
| Some influence | 2 | 38% |
| Little influence | 3 | 34% |
| No influence | 4 | 23% |
| Did not receive comments | 5 | 5% |

20. Would you say that all or much of the research carried out under the NSF award has "applied", "practical" or "policy" implications beyond the advancement of knowledge itself?

| | |
|---|---|
| Yes (ANSWER Q. 20A).....1 | 53% |
| No (SKIP TO Q. 21).....2 | 47% |

20A. If yes, are these implications:

| | |
|---|---|
| Clear and immediate.....1 | 24% |
| Fairly clear, long range.....2 | 53% |
| Potential but not clear.....3 | 24% |

21. Whether your proposal was awarded or declined, how much did the reviewers' comments help you to understand the Foundation's decision? CIRCLE ONE

| | |
|---|---|
| A great deal.....1 | 33% |
| Somewhat.....2 | 35% |
| Slightly.....3 | 16% |
| Not at all.....4 | 17% |

22. Whether your proposal was awarded or declined, how satisfied or dissatisfied are you with the review process overall as it operates at NSF? CIRCLE ONE

| | |
|---|---|
| Very satisfied.....1 | 18% |
| Moderately satisfied.....2 | 31% |
| Neither satisfied nor dissatisfied.....3 | 14% |
| Moderately dissatisfied (ANSWER Q. 22A).....4 | 21% |
| Dissatisfied (ANSWER Q. 22A).....5 | 17% |

22A. Why are you dissatisfied?

(93% stated reasons)

23. Are you:

| | |
|---|---|
| Male (SKIP TO Q. 24).....1 | 87% |
| Female.....2 | 13% |

23A. If eligible*, did you submit your proposal to the NSF Research Opportunities for Women activity?

| | |
|---|---|
| Yes (SKIP TO Q. 24).....1 | 31% |
| No.....2 | 69% |

23B. Were you aware of the NSF Research Opportunities for Women activity that is designed to promote opportunities for women scientists and engineers to conduct independent research?

| | |
|---|---|
| Yes (ANSWER Q. 23C).....1 | 45% |
| No (SKIP TO Q. 24).....2 | 55% |

23C. If yes, please tell us why you did not submit your proposal through this program.

(84% of those who were aware of the program but did not submit their proposal to the program stated reasons)

*Women eligible to submit proposals are:

Those who have received their doctorates at least 3 years prior to submission of the proposal to NSF and have not previously served as a principal investigator on an individual Federal award for scientific or engineering research; or those with doctorates whose subsequent research careers have been interrupted for at least 2 or the past 5 years and who have not served as a principal investigator on a Federal award for scientific or engineering research since reentering their careers.

24. Is your race/ethnicity:

| | |
|---|---|
| White (SKIP TO Q. 25).....1 | 88% |
| Asian (SKIP TO Q. 25).....2 | 9% |
| Black.....3 | .8% |
| Hispanic.....4 | 1.1% |
| Native American.....5 | .2% |

24A. If eligible*, did you submit this proposal to the Minority Research Initiation program at NSF?

| | |
|---|---|
| Yes (SKIP TO Q. 25).....1 | 24% |
| No.....2 | 76% |

24B. Were you aware of the Minority Research Initiation program at NSF to increase the participation of minority researchers?

| | |
|---|---|
| Yes.....1 | 41% |
| No (SKIP TO Q. 25).....2 | 59% |

24C. If yes, please tell us why you did not submit your proposal through this program.

(77% stated reasons)

_____

_____

*Persons eligible to submit proposals are:

Minority scientists and engineers who hold full-time faculty or research-related positions at colleges or universities in the United States, its possessions and territories, and have not previously received Federal research support as faculty members.

The term "minority" refers to those ethnic minority groups that are significantly underrepresented in advanced levels of science and engineering, i.e., Blacks, Native Americans, Mexican Americans, Puerto Ricans, Alaskan Natives (Eskimo or Aleut), and Native Pacific Islanders (Polynesian or Micronesian). Investigators must be nationals of the United States.

25. Was your institution:

One of the following institutions that received sixty or more NSF research project grants in 1985 (SKIP TO Q. 26).....1 — 23%

| | |
|---|---|
| Columbia Univ. | U. of California - Berkeley |
| Cornell Univ. | U. of California - Los Angeles |
| Harvard Univ. | U. of California - San Diego |
| Massachusetts Inst. of Technology | U. of Colorado - Boulder |
| Northwestern Univ. | U. of Illinois - Urbana |
| Ohio State Univ. | U. of Maryland - College Park |
| Princeton Univ. | U. of Michigan - Ann Arbor |
| Purdue Univ. | U. of Pennsylvania |
| Stanford Univ. | U. of Texas - Austin |
| | U. of Washington |
| | U. of Wisconsin - Madison |
| | Woods Hole Oceanographic Inst. |

Other University that offers doctoral degrees (SKIP TO Q. 26)....2 — 62%

Undergraduate or Primarily Undergraduate Institution* (ANSWER Q. 25A).....3 — 11%

Other (SKIP TO Q. 26).....4 — 5%

25A. Did you submit your proposal for review through the Program for Primarily Undergraduate Institutions?

Yes (SKIP TO Q. 26).....1 — 47%

No.....2 — 53%

25B. Were you aware that NSF has a program designed for proposals submitted from primarily undergraduate institutions?

Yes.....1 — 45%

No (SKIP TO Q. 26).....2 — 55%

25C. If yes, please tell us why you did not submit your proposal through this program.

(82% stated reasons)

*NSF defines primarily undergraduate institutions as those institutions that did not award more than 20 doctorates in fields of science/engineering supported by NSF in the 2 calendar years preceding the proposal submission date.

26. To what extent is progress in your own research work hindered because of:
CIRCLE ONE NUMBER ON EACH LINE

| | <--Not at All To a Great--> Extent | | | | | | AVERAGE |
|---|---|---|---|---|---|---|---|
| A. Shortages of research personnel..... | 1 | 2 | 3 | 4 | 5 | N/A | 3.1 |
| B. Shortages of capable graduate students.. | 1 | 2 | 3 | 4 | 5 | N/A | 3.2 |
| C. Unavailability of data..... | 1 | 2 | 3 | 4 | 5 | N/A | 2.1 |
| D. Insufficient theoretical models..... | 1 | 2 | 3 | 4 | 5 | N/A | 2.0 |
| E. Inadequate equipment..... | 1 | 2 | 3 | 4 | 5 | N/A | 2.8 |
| F. Inadequate facilities..... | 1 | 2 | 3 | 4 | 5 | N/A | 2.6 |
| G. Other, PLEASE SPECIFY_____ | | | | | | | |

27. To what extent do you agree or disagree with the following statements.
CIRCLE ONE NUMBER ON EACH LINE

| | <--STRONGLY DISAGREE | | | | STRONGLY--> AGREE | AVERAGE |
|---|---|---|---|---|---|---|
| A. The present peer review process at NSF makes it difficult for researchers to submit multidisciplinary proposals..... | 1 | 2 | 3 | 4 | 5 | 3.3 |
| B. NSF should make greater use of grants that permit groups of researchers to band together in pursuing common research problems..... | 1 | 2 | 3 | 4 | 5 | 3.1 |
| C. NSF is not likely to fund high-risk exploratory research because the likelihood of obtaining favorable reviews is slim..... | 1 | 2 | 3 | 4 | 5 | 4.0 |
| D. In making awards NSF should place substantially more emphasis on the research history of the investigator except for young researchers..... | 1 | 2 | 3 | 4 | 5 | 3.4 |
| E. Proven researchers experience difficulty obtaining NSF awards when they apply for grants outside their disciplines..... | 1 | 2 | 3 | 4 | 5 | 4.0 |

28. Referring to the institutional categories listed in question 25, from what type of institution did you receive your highest degree? CIRCLE ONE

| | |
|---|---|
| One of the institutions listed in Question 25.....1 | 45% |
| Other University that offers doctoral degrees.....2 | 54% |
| Undergraduate or Primarily Undergraduate Institution.....3 | 4% |

29. From what type of institution did you receive your B.S. or B.A. degree? CIRCLE ONE

| | |
|---|---|
| One of the institutions listed in Question 25.....1 | 22% |
| Other University that offers doctoral degrees.....2 | 49% |
| Undergraduate or Primarily Undergraduate Institution.....3 | 29% |

30. What is your principal field of research? (e.g. Chemistry, Physics, Oceanography, Mechanical Engineering, etc.) ENTER FIELD

Field Over 97% reported their field.

31. In what state is your present institution located? ENTER STATE

State CA 11%, NY 10%, MA 6%, TX 5%, OH 4%, MI 3.5%, FL 3%

32. What year did you receive your highest degree? ENTER YEAR

Year _____

| | |
|---|---|
| before 1960..... | 11% |
| 1960-1969..... | 25% |
| 1970-1979..... | 41% |
| 1980-1987..... | 21% |

33. In a normal week, roughly what proportion of your actual work time is devoted to these activities (to nearest 5%):

| | AVERAGE |
|---|---|
| Undergraduate instruction, preparation, advising | 21 % |
| Graduate teaching, advising, consultation, etc. | 18 % |
| Research and related activities, preparing proposals | 41 % |
| Service to your discipline: e.g. reviewing proposals | 6 % |
| Consulting or other outside employment | 2 % |
| Administrative duties for your institution | 11 % |
| Other | 2 % |
| Total = | 100% * |

34. Approximately how many articles have you had published in referred journals over the last five years?

Number of Articles....._____

| | |
|---|---|
| less than 2 | 8% |
| 3-5 | 19% |
| 6-9 | 18% |
| 10-19 | 34% |
| 20+ | 22% |

35. Approximately how many graduate students (M.S. or Ph.D.) have you supervised over the last five years?

Number of Graduate Students....._____

| | |
|---|---|
| 0 | 15% |
| 1-2 | 19% |
| 3-5 | 29% |
| 6-9 | 17% |
| 10+ | 19% |

36. Approximately how many post-doctoral researchers have you trained over the past five years?

Number of Post-doctorals....._____

| | |
|---|---|
| 0 | 61% |
| 1 | 15% |
| 2 | 9% |
| 3-4 | 8% |
| 5 | 7% |

37. During the past five years, have you served as a mail reviewer or panelist for NSF?

| | |
|---|---|
| Yes (Answer Question 37A).....1 | 75% |
| No (Skip to Question 38).....2 | 25% |

37A. During the past five years, for how many proposals have you completed written reviews?

Number of Proposals....._____

| | |
|---|---|
| 1 | 9% |
| 2 | 9% |
| 3 | 10% |
| 4-6 | 24% |
| 7-10 | 19% |
| 11-19 | 13% |
| 20+ | 17% |

38. Approximately how many proposals have you submitted to NSF during the past five years? ENTER NUMBERS OF PROPOSALS....._____

1-5.... 89%
6-10... 10%
11... 1%

39. Approximately how many of the above proposals were funded by NSF? ENTER NUMBER OF NSF AWARDS....._____

(See p. 9 of report text)

40. Of the number submitted to but not funded by NSF, approximately how many were funded by other sources? ENTER NUMBER FUNDED

Number Funded by Other Sources....._____

0.... 64%
1.... 25%
2.... 8%
3+... 4%

41. What is the current level of funding for your research whether as PI or researcher from all extramural sources on a yearly basis? (ROUND TO NEAREST $1,000. FOR EXAMPLE: ENTER 50 FOR $50,000)

Level of Funding.....

less than 10K .. 24%
10K-39K .. 20%
40K-69K .. 16%
70K-149K.. 21%
150K+. 19%

42. Which Federal Agency (including NSF) or other funding source is your first choice for support of your research? ENTER FUNDING SOURCE

Agency or Funding Source...NSF,..66%, NIH,..20%, Other 19%

42A. Why? (84% stated reasons)

43. We would welcome any comments that you might have regarding the selection process of proposals as it operates at NSF. Please attach additional sheets of paper if necessary.

(50% provided comments)